


page 1 of 2

Rosalie A. Centeno

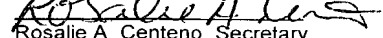
U.S. APPLICATION NO. (if known) (37 CFR 1.53) <b>10/018144</b>		INTERNATIONAL APPLICATION NO. <b>PCT/EP00/05442</b>		ATTORNEY'S DOCKET NUMBER <b>AZ. 3012</b>	
21. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. .... <b>\$1040.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$890.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$740.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$710.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b>  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>CALCULATIONS PTO USE ONLY</b>	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 890.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	31 - 20 =	11	x \$18.00	\$ 198.00	
Independent claims	2 - 3 =	0	x \$84.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				\$ \$280.00	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 1088.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	
<b>SUBTOTAL =</b>				\$ 1088.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
<b>TOTAL NATIONAL FEE =</b>				\$ 1088.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.				\$	
<b>TOTAL FEES ENCLOSED =</b>				\$ 1088.00	
				Amount to be refunded: \$	
				charged: \$	
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>1088.00</u> to cover the above fees is enclosed.  b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit to any overpayment to Deposit Account No. <u>02-1653</u> . A duplicate copy of this sheet is enclosed. In the event there is any discrepancy in the amount sent herewith or at any time in the future please charge any additional fee, credit or overpayment to the above deposit account number. c. <input checked="" type="checkbox"/> d. <input type="checkbox"/> Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO.					
ROBERT W. BECKER & ASSOCIATES 11896 N. HIGHWAY 14 SUITE B. TIJERAS, NEW MEXICO 87059			 SIGNATURE:  Robert W. Becker NAME:  <u>26,255</u> REGISTRATION NUMBER		

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Rosalie A. Centeno, Secretary

In the Application of Björn Liedtke

Ser.No.: Not Yet Known (Based on De 199 27 516.5 filed 16 June 1999 and PCT/EP00/05442 filed 14 June 2000)

For: APPARATUS AND METHOD FOR PRODUCING A DATA CARRIER

Filed on: December 14, 2001

Assistant Commissioner for Patents

Washington, DC 20231

**PRELIMINARY AMENDMENT ACCOMPANYING PCT NATIONAL STAGE APPLICATION**

Sir:

Prior to examination, please amend the above-identified application as follows.

**IN THE SPECIFICATION:**

On page 1, immediately after the title, please insert the following heading:

--Background of the Invention--.

On page 3, between lines 4 and 5, please insert the following heading:

--Summary of the Invention--.

On page 7, between lines 6 and 7, please insert the following heading:

--Brief Description of the Drawing--;

On page 7, between lines 20 and 21, please insert the following heading:

--Description of Preferred Embodiments--.

On page 13, line 11, please replace the number "32" with the number "42".

On page 16, line 8, please replace the number "63" with the number "63".

On page 18, after line 17, please insert the following paragraph:

--The specification incorporates by reference the disclosure of German priority document 199 27 516.5 filed 16 June 1999 and PCT/EP00/05442 filed 14 June 2000.

The present invention is, of course, in no way restricted to the specific disclosure of the specification and drawings, but also encompasses any modifications within the scope of the appended claims.--

**IN THE CLAIMS:**

Please cancel claims 1 - 31, and replace them with the attached claims 32 – 62.

**IN THE DRAWINGS:**

Please replace page 4 of the drawings (Figs. 4a, 4b, and 4c) with the attached drawing proposal (also page 4, Figs. 4a, 4b, and 4c).

## REMARKS

Claims 32 - 62 are pending in the application.

Appropriate headings have been added to the specification, and claims from the literal translation have been replaced by claims drafted in conformity with U.S. Patent practice.

The application in its amended state is believed to be in condition for allowance. However, should the Examiner have any comments or suggestions, or wish to discuss the merits of the application, the undersigned would very much welcome a telephone call in order to expedite placement of the application into condition for allowance.

Respectfully submitted,

Robert - Becker

Robert W. Becker, Reg. No. 26,255

for Applicant(s)

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32. A method of producing a data carrier by adhering at least two substrates to one another, said method including the steps of:

providing a first substrate ;

pressing an adhesive film, which is adhesive on two sides, against said first substrate via a rotating pressure roller while moving said first substrate and said pressure roller relative to one another, wherein such relative movement extends parallel to a surface of said first substrate;

aligning a second substrate relative to said first substrate; and

joining said first and second substrates together.

33. A method according to claim 32, which includes the step of withdrawing said adhesive film from a carrier film during or after application of said adhesive film against said first substrate.

34. A method according to claim 32, which includes the step of withdrawing a protective film from said adhesive film prior to application of said adhesive film against said first substrate.

35. A method according to claim 33, wherein a shape and size of said adhesive film corresponds to surfaces of said first and second substrates that are to be adhesively joined.

36. A method according to claim 35, wherein sections of said adhesive film that correspond to a shape and size of said first and second substrate are punched onto said carrier film.

37. A method according to claim 32, which includes the step of applying said adhesive film in a centered manner to a surface of said first substrate that is to be adhered.

5 38. A method according to claim 32, which includes the step of aligning said adhesive film and said first substrate with one another prior to said step of pressing said adhesive film against said first substrate.

39. A method according to claim 32, which includes the step of controlling a pressure of said pressure roller.

10 40. A method according to claim 32, which includes the step of holding said adhesive film at a pre-specified angle relative to a surface of said first substrate prior to said step of pressing said adhesive film against said first substrate.

15 41. A method according to claim 32, which includes the step of moving said first substrate linearly past said pressure roller.

42. A method according to claim 32, which includes the step of rotating said pressure roller synchronously to a movement of said first substrate.

20 43. A method according to claim 32, wherein said first and second substrates are placed on a centering and holding device for aligning said substrate.

44. A method according to claim 43, wherein prior to said joining step, said centering and holding device holds said first and second substrate spaced from one another.

45. A method according to claim 32, wherein said step of joining said first and second substrates together is effected in a vacuum.

5 46. A method according to claim 32, wherein said joining step includes pressing said first and second substrates together.

47. A method according to claim 46, which includes the step of controlling a pressure exerted upon said first and second substrates.

48. A method according to claim 32, wherein said adhesive film is an adhesive film that responds to pressure.

10 49. A method according to claim 32, wherein said adhesive film is hardened.

50. A method according to claim 32, wherein said adhesive film is a single layer of adhesive material.

15 51. An apparatus for producing a data carrier having at least two substrates that are adhered to one another, comprising:

a laminating station for applying to a first substrate an adhesive film that is adhesive on two sides, wherein said laminating station comprises a rotatable pressure roller and a device for effecting relative movement between said first substrate and said pressure roller, wherein such relative movement extends parallel to a surface of said first substrate; and

20 a substrate adhering station for aligning and joining said first substrate and a second substrate together.

52. An apparatus according to claim 51, wherein a shape and size of said adhesive film corresponds to surfaces of said first and second substrates to be adhered.

53. An apparatus according to claim 51, wherein sections of said adhesive film that correspond to a shape and size of surfaces of said first and second substrates to be adhered are punched onto a carrier film.

54. An apparatus according to claim 51, wherein said laminating station is provided with an aligning unit for aligning said adhesive film with a surface of said substrate that is to be adhered.

55. An apparatus according to claim 54, wherein said aligning unit is provided with at least one linear movement unit for said substrate.

56. An apparatus according to claim 51, wherein a centering and holding device is provided that in a first position holds said first and second substrates spaced apart and in a second position enables a centered joining of said first and second substrates.

57. An apparatus according to claim 51, wherein said substrate adhering station is provided with a vacuum chamber.

58. An apparatus according to claim 57, wherein said vacuum chamber is provided with a hood and a base that is formed by a substrate support element.

59. An apparatus according to claim 56, wherein said substrate adhering station is provided with a pressure ram.



60. An apparatus according to claim 59, wherein said pressure ram is provided with an element for actuating said centering and holding device between said first and second positions.

5 61. An apparatus according to claim 51, wherein said substrate adhering station is provided with an apparatus for applying compressed air to at least one of said first and second substrates for pressing said substrates together.

62. An apparatus according to claim 51, wherein said adhesive film is a layer of adhesive material.

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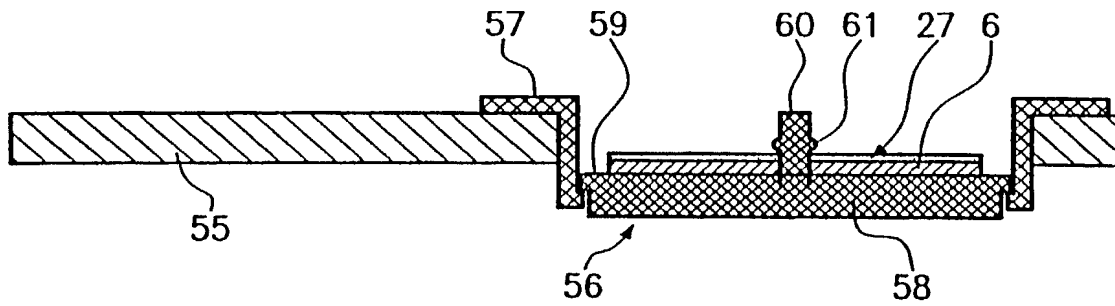


FIG. 4a

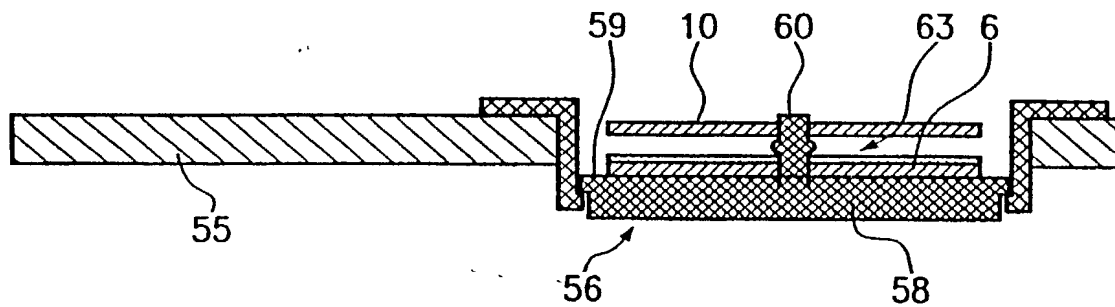


FIG. 4b

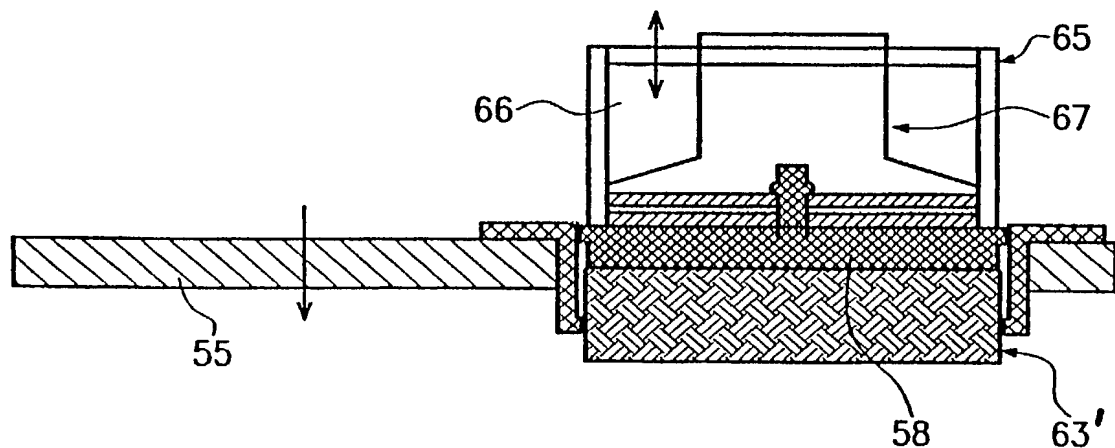


FIG. 4c

DRAWING PROPOSAL

DRAWING PROPOSAL

32. A method of producing a data carrier by adhering at least two substrates to one another, said method including the steps of:

providing a first substrate<sup>6</sup>;

pressing an adhesive<sup>25</sup> film, which is adhesive on two sides, against said first substrate<sup>6</sup> via a rotating pressure roller<sup>33</sup> while moving said first substrate and said pressure roller relative to one another, wherein such relative movement extends parallel to a surface of said first substrate;

aligning a second substrate<sup>10</sup> relative to said first substrate<sup>6</sup>; and

joining said first and second substrates together.

33. A method according to claim 32, which includes the step of withdrawing said adhesive<sup>25</sup> film from a carrier film<sup>26</sup> during or after application of said adhesive film against said first substrate.

34. A method according to claim 32, which includes the step of withdrawing a protective film<sup>24</sup> from said adhesive<sup>25</sup> film prior to application of said adhesive film against said first substrate<sup>6</sup>.

35. A method according to claim 33, wherein a shape and size of said adhesive<sup>25</sup> film corresponds to surfaces of said first and second substrates that are to be adhesively joined.<sup>6,10</sup>

36. A method according to claim 35, wherein sections<sup>27</sup> of said adhesive<sup>25</sup> film that correspond to a shape and size of said first and second substrate<sup>6,10</sup> are punched onto said carrier film<sup>26</sup>.

\* for Examiners Reference

37. A method according to claim 32, which includes the step of applying said adhesive film<sup>25</sup> in a centered manner to a surface of said first substrate<sup>6</sup> that is to be adhered.

38. A method according to claim 32, which includes the step of aligning said adhesive film<sup>25</sup> and said first substrate<sup>6</sup> with one another prior to said step of pressing said adhesive film against said first substrate.

39. A method according to claim 32, which includes the step of controlling a pressure of said pressure roller<sup>33</sup>.

40. A method according to claim 32, which includes the step of holding said adhesive film<sup>25</sup> at a pre-specified angle relative to a surface of said first substrate<sup>6</sup> prior to said step of pressing said adhesive film against said first substrate.

41. A method according to claim 32, which includes the step of moving said first substrate<sup>6</sup> linearly past said pressure roller<sup>33</sup>.

42. A method according to claim 32, which includes the step of rotating said pressure roller<sup>33</sup> synchronously to a movement of said first substrate<sup>6</sup>.

43. A method according to claim 32, wherein said first and second substrates<sup>6,10</sup> are placed on a centering and holding device<sup>60</sup> for aligning said substrate.

44. A method according to claim 43, wherein prior to said joining step, said centering and holding device<sup>60</sup> holds said first and second substrates<sup>6,10</sup> spaced from one another.

45. A method according to claim 32, wherein said step of joining said first and second substrates together is effected in a vacuum.

46. A method according to claim 32, wherein said joining step includes pressing said first and second substrates together.

47. A method according to claim 46, which includes the step of controlling a pressure exerted upon said first and second substrates.

48. A method according to claim 32, wherein said adhesive film is an adhesive film that responds to pressure.

49. A method according to claim 32, wherein said adhesive film is hardened.

50. A method according to claim 32, wherein said adhesive film is a single layer of adhesive material.

51. An apparatus for producing a data carrier having at least two substrates that are adhered to one another, comprising:

a laminating station for applying to a first substrate an adhesive film that is adhesive on two sides, wherein said laminating station comprises a rotatable pressure roller and a device for effecting relative movement between said first substrate and said pressure roller, wherein such relative movement extends parallel to a surface of said first substrate; and

a substrate adhering station for aligning and joining said first substrate and a second substrate together.

52. An apparatus according to claim 51, wherein a shape and size of said adhesive <sup>25</sup> film corresponds to surfaces of said first and second substrates <sup>6,10</sup> to be adhered.

53. An apparatus according to claim 51, wherein sections of said adhesive <sup>25</sup> film that correspond to a shape and size of surfaces of said first and second substrates <sup>6,10</sup> to be adhered are punched onto a carrier film <sup>26</sup>.

54. An apparatus according to claim 51, wherein said laminating station is provided with an aligning unit for aligning said adhesive <sup>25</sup> film with a surface of said substrate <sup>6</sup> that is to be adhered.

55. An apparatus according to claim 54, wherein said aligning unit is provided with at least one linear movement unit <sup>47</sup> for said substrate.

56. An apparatus according to claim 51, wherein a centering and holding device <sup>60</sup> is provided that in a first position holds said first and second substrates <sup>6,10</sup> spaced apart and in a second position enables a centered joining of said first and second substrates.

57. An apparatus according to claim 51, wherein said substrate adhering station <sup>11</sup> is provided with a vacuum chamber <sup>66</sup>.

58. An apparatus according to claim 57, wherein said vacuum chamber <sup>66</sup> is provided with a hood <sup>65</sup> and a base <sup>59</sup> that is formed by a substrate support element <sup>58</sup>.

59. An apparatus according to claim 56, wherein said substrate adhering station <sup>11</sup> is provided with a pressure ram <sup>67</sup>.

60. An apparatus according to claim 59, wherein said pressure <sup>67</sup>ram is provided with an element for actuating said centering and holding device <sup>60</sup> between said first and second positions.

5 61. An apparatus according to claim 51, wherein said substrate adhering station <sup>11</sup> is provided with an apparatus for applying compressed air to at least one of said first and second substrates for pressing said substrates <sup>6,10</sup> together.

62. <sup>25</sup>An apparatus according to claim 51, wherein said adhesive film is a layer of adhesive material.

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# Apparatus and Method for Producing a Data Carrier

The present invention relates to an apparatus and a method for producing a data carrier having at least two substrates adhered with a two-sided adhesive film.

5           Such data carriers are, for example, optical recording media such as DVDs, etc., that comprise at least two substrates adhered to one another. In one known apparatus for producing such a data carrier, as is known for instance from application DE-A-197 18 471, from the same applicant, two substrates were adhered to one another  
10           by means of a lacquer. Typically the lacquer is applied to the center of one of the substrates, which is then centrifuged in order to achieve the most uniform possible film of lacquer on the substrate. In addition, residual lacquer is centrifuged off of the substrate and must later be disposed of in a complex process. Once the layer of lacquer has been  
15           applied, the substrates are joined, whereby prior to their joining one of the substrates is bent such that it first comes into contact with the other substrate only in a central region. As the substrates are joined this bending is gradually eliminated so that the other regions of the wafers also come into contact with one another. This bending is  
20           advantageous for preventing air from being trapped between the substrates, which could affect the usability of the data carrier thus produced. However, both the centrifuging of the substrates when the layer of lacquer is applied and the bending of the substrates when they are joined involve the risk of damaging the substrates. In addition, the



5 process for applying the lacquer is very complex, and it is not always possible to obtain a uniform layer of lacquer throughout a plurality of lacquering processes. Furthermore, it is very time-consuming and expensive to dispose of the residual lacquer that is centrifuged off during the centrifuging process.

10 Known from EP-A-0 854 477 is a method for producing a data carrier in which two substrates are adhered to one another by applying to a first substrate a film that is coated on two sides with adhesive, aligning a second substrate with respect to the first substrate, and joining the substrates. The coated film maintained on a carrier film is moved over the first substrate using a transport apparatus, held in this position, and then using an elastic ram is moved into contact with the substrate and pressed thereupon. Then the ram is moved away from the substrate and the carrier film is withdrawn from the coated film using a roller.

15 In this process there is the risk that air bubbles that have a negative impact on the quality of the data carrier can be trapped between the substrate and the adhesive film. In addition, the process for applying the adhesive film is very time-consuming because movement of the film during the pressing and subsequent withdrawal of the carrier film must be stopped.

20 Starting with the apparatus described in the foregoing and the method for producing the data carrier, the object of the present invention is to provide an apparatus and a method that make it possible

to produce a high-quality data carrier simply and cost-effectively, in particular without trapping any air. The object of the present invention is furthermore to decrease the processing times required for adhering two substrates.

5           The object of the present invention is achieved inventively in a method of the type cited in the foregoing in that the adhesive film (25) is pressed onto the substrate (6) using a rotating pressure roller (33) while the substrate (6) and the pressure roller (33) are moved relative to one another. This prevents air from being trapped between the  
10           substrate and the adhesive film because the film is pressed onto the substrate along a straight line in a controlled manner. Furthermore, the movement of the film does not have to be stopped, which results in a continuous process. In addition to applying the film, the carrier film can be removed from the adhesive film in the same work step, thus  
15           accelerating the process even further.

          In accordance with one particularly preferred embodiment of the present invention, during or after its application to the first substrate the adhesive film is withdrawn from a carrier film that has a required stability for making it possible to transport the adhesive film. The  
20           carrier film furthermore prevents one side of the adhesive film from prematurely adhering to other objects and prevents contamination of the adhesive film. Preferably a protective film is withdrawn from the side of the adhesive film opposite the carrier film prior to applying the adhesive film to the first substrate, the protective film preventing

contamination of the other side of the adhesive film prior to adhering to the first substrate.

In order to ensure that the substrates adhere well and uniformly, the shape and size of the adhesive film corresponds to those of the surfaces of the substrates to be adhered. This ensures that the substrates are adhered to one another across their entire surface and that no adhesive film projects over the surfaces that are not to be joined. Sections of the adhesive film that correspond to the shape and size of the substrates are preferably punched onto the carrier film. The adhesive film is preferably applied centered on the surface of the substrate to be adhered in order to achieve the advantages cited above. For this purpose the adhesive film and the substrate are aligned with one another prior to application.

The pressure of the pressure roller is preferably controlled.

Prior to pressing by the pressure roller, the adhesive film is preferably held at a pre-specified angle relative to the surface of the substrate in order to ensure that the adhesive film does not come into contact with the surface of the substrate prior to the pressure from the pressure roller. This ensures uniform pressure on the adhesive film and prevents air from being trapped between adhesive film and substrate. Preferably the substrate and the pressure roller are moved relative to one another while the adhesive film is being applied. The substrate is preferably moved past the pressure roller linearly, and the pressure roller is preferably rotated about its longitudinal axis



The advantages cited with regard to the method are achieved with such an apparatus.

Advantageously the apparatus has a centering and holding device that in a first position holds the substrates spaced from one another and in a second position enables centered joining of the substrates. The substrate adhering station preferably has a vacuum chamber in order to prevent air from being trapped between the substrates. The vacuum chamber advantageously has a hood and a base that is formed in one embodiment by a substrate support element that is part of the centering and holding device. Using the centering and holding device as a part of the vacuum chamber makes it possible to reduce the size of the vacuum chamber, and thus the costs associated with deaerating the vacuum chamber, to a minimum. Preferably the substrate adhering station has a pressure ram in order to securely join the substrates. The pressure ram is preferably parallel to a support surface of the substrates in order to ensure that the substrates are pressed together uniformly. In an alternative embodiment, an apparatus is provided for applying compressed air to one of the substrates, which makes it possible to press the substrates together in a particularly uniform manner.

In accordance with one preferred embodiment of the present invention, the pressure ram has an element for actuating the centering and holding device between the first and second positions for

controlled release of the holding function in the device for joining the substrates.

5 The adhesive film is advantageously one layer of an adhesive, whereby a film that is coated on both sides can be omitted. The use of one layer of pure adhesive improves the optical properties in the joining region of the substrates.

The present invention is explained in greater detail in the following using preferred exemplary embodiments with reference to the figures, in which:

- 10 Fig. 1 is a schematic representation of an apparatus for producing data carriers in accordance with the present invention;
- Fig. 2 is a schematic view of parts of a laminating station in accordance with the present invention;
- 15 Fig. 3 is a side view of an alternative embodiment of a laminating station in accordance with the present invention;
- Figs. 4a-4c illustrate a substrate adhering station for aligning and joining substrates in accordance with the present invention during various method steps.
- 20

Figure 1 illustrates an apparatus 1 for producing a DVD with two adhered substrate halves.

The apparatus has first and second feed units 3, 4 for feeding two substrate halves that form a DVD once they have been adhered. A

first substrate half 6 from the first feed station 3 is conveyed to a laminating station 7 that is described in greater detail with reference to Figures 2 and 3. In the laminating station, a pressure-sensitive adhesive tape or film is applied to the surface of the substrate half 6 to be adhered. The terms adhesive tape and adhesive film are to be understood as a layer of adhesive without a carrier material. The optical properties of a layer of adhesive can be controlled more precisely and better than those of a carrier material coated on both sides, as is known, for instance from EP A 0 854 477, cited in the foregoing. The first substrate half 6 is subsequently transported to a rotary table 8 and placed on a centering and holding device that is described in greater detail with reference to Figures 4a - c. Then the rotary table is rotated into a position in which a second substrate half 10 is also placed on the centering and holding device, whereby the two substrates are held centered over one another with a gap located between them, as will be described with reference to Figures 4a - c.

Then the rotary table is rotated further until the substrate halves arranged above one another are arranged in a processing station 11 for joining the substrates. The processing station 11 is described in more detail with reference to Figures 4a - c.

Once the substrate halves have been joined, they are rotated to an unloading position and loaded onto another rotary table. The rotary table transports the joined substrates to a scanning unit 16 in which the joined substrates are scanned to determine if they have been

damaged. If there is damage, they are deposited in a station 18 and then discarded. Otherwise they are deposited on a table 20 and collected for further processing.

5 The apparatus 1 is arranged in a clean room in which each of the work steps can be performed under clean room conditions.

10 Figures 2 and 3 are schematic representations of a laminating station 7 in accordance with the present invention, whereby the components of the laminating stations 7 illustrated in Figures 2 and 3 are arranged somewhat differently. However, the same reference numbers are used for identical/similar components in the following description of the laminating station in accordance with Figures 2 and 3.

15 The laminating station 7 has a feed roller 22 on which a tape-like laminating film 23 is rolled. The laminating film 23 comprises a total of three films, namely, a protective film 24, an adhesive film (adhesive layer) 25 that is adhesive on two sides, and a carrier film 26, as can be best seen in the enlarged circular detail in Figure 2. The adhesive film 25 has sections 27 that are punched corresponding to the size and shape of a surface of the substrate half 6 that is to be adhered. The adhesive layer is an adhesive film that reacts to pressure and that is generally known as PSA tape, the adhesion properties of which can be adjusted via the pressure exerted.

20

The laminating station furthermore has a take-up roller 28 on which the remainder of the laminating film 23 is taken up after a



laminating process. The laminating film 23 is conducted between the feed roller 22 and the take-up roller 28 around a plurality of guide rollers 30 through 38 in order to provide a defined path for the tape-like laminating film 23 between the rollers 22 and 28. Each of the rollers 30 through 38 is rotatable about its axis of rotation, and the rollers 31 and 37 are designed as so-called compensating rollers that are borne movable in the horizontal direction in order to make it possible to compensate for the length of the laminating film 23 between the rollers 22 and 28. This makes it possible for the rollers 22 and 28 to be rotated at a constant speed despite discontinuous laminating cycles, as will be described in the following. The parts of the adhesive film 25 that are not needed can be removed in advance, that is, prior to introducing the laminating film into the laminating station, for instance during production of the laminating film, or they can remain on the film in order to ensure a uniform thickness of the film 23 across the entire width and length thereof, at least prior to a laminating process.

The laminating film 23 is furthermore conducted around a wedge-shaped blade 40, where the laminating film 23 turns sharply in order to make it possible to remove the protective film 24 from the laminating film 23 so that one side of the adhesive film 25 is exposed for adhering to one substrate half 6. The removal of the protective film 24 is best seen in Figure 3. Once removed, the protective film 24 is rolled onto a roller (not shown in greater detail). An alternative type of



can be moved in any direction via suitable moving apparatus (not shown in greater detail). A lowerable centering pin 48 ensures precise alignment of the substrate half 6 on the support and transport unit 47. The pin 48 can be lowered during the laminating process so that it is not impaired. This is achieved in that it is pressed upward into the position shown in Figure 3 by a spring with relatively limited spring force. When pressure is exerted on the pin from above, it is pressed downward against the spring force. Alternatively, the pin can be moved via a cylinder or motor.

Prior to the lamination of the substrate 6, the transport and support unit 47 is moved in the X direction, which corresponds to the longitudinal direction of the laminating film 23, against a stop. This ensures that the substrate 6 and the section 27 of the adhesive film 25 previously aligned in the longitudinal direction are aligned to one another. Then the transport and support unit 47 is moved back and forth in the Z direction, which runs transverse to the longitudinal direction of the laminating film 23. A sensor pair 50 allocated to the transport and support unit 47 detects a contour, such as for instance the contour of a center hole, of the punched section 27 of the adhesive film 25, which makes it possible to laterally align the substrate half 6 with respect to the section 27.

Once the substrate half 6 has been aligned in the above manner both in the X direction and in the Z direction with respect to the section 27 of the adhesive film 25, the transport and support unit 47 is raised in

the Y direction. Now the motor 32 drives the roller 34, which causes the laminating film 23 to move in the X direction. At the same time and synchronized with the rotation, the transport and support unit 47 is moved in the X direction. The section 27 comes into contact with the surface of the substrate 6 to be adhered and is pressed thereagainst by the pressure roller 33 so that it adheres to the substrate half 6 and detaches from the carrier film 26. The synchronized movement of the drive roller 34 with the transport and support unit 47 applies a section 27 of the adhesive film 25 centered on the substrate half 6 so that the section 27 of the film 25 completely covers the side of the substrate half 6 to be adhered and does not project over the edge. The pressure of the pressure roller in the Y direction is controlled via the position of the transport and support unit 47 in order to control the adhesion properties of the adhesive film 25. Alternatively, of course, the pressure roller 33 can move in the direction of the transport and support unit. A spring-type suspension system can be provided for good control or compensation of the pressure. The spring-type suspension can be provided via a spring or compressed air cylinder.

Then the substrate half 6 thus provided with the section 27 of adhesive film 25 is transported via a suitable handling apparatus 52, such as an interior hole gripper, removed from the transport and support unit 47, and is transported to the rotary table 8 in accordance with Figure 1.

5 A new substrate half 6 is loaded onto the transport and support unit 47, and the process is repeated. As was mentioned in the foregoing, the rollers 22 and 28 rotate continuously during the entire process, although the adhering process is not continuous. The longitudinal compensation of the laminating film 23 that is therefore necessary is achieved via a horizontal movement of the compensating rollers 31 and 37, as already mentioned in the foregoing.

10 Although the laminating film has three layers in accordance with the description in the foregoing, namely a protective film 24, an adhesive film 25, and a carrier film 26, it should be noted that it is not absolutely necessary for there to be a protective film 24. However, if no protective film 24 is used, at least the rollers 30 and 32 should be specially coated in order to prevent the exposed adhesive film 25 from adhering to these rollers. Furthermore, the adhesive film 25 must also  
15 not be a film that responds to pressure, and it can also be formed by a carrier material coated on two sides instead of one purely adhesive layer.

20 Alternatively, the rollers up to the roller 33 can be omitted, whereby in this case the rollers 22 and 28 must be controlled such that the sections 27 are aligned and a movement of the laminating film 23 is achieved synchronized with the transport and support unit 47.

In addition, a single sensor, such as for instance a camera, can be used for the above alignment processes instead of the sensors 45 and 50.



Then the receiving unit 56 is moved into the position labeled 2. There the second substrate half 10 is likewise placed on the substrate receiving unit 56, whereby the pin 60 centers the substrate half 10 and holds it spaced over the first substrate half 6, as Figure 4b illustrates.

5 Then the receiving unit 56 is moved into position 3 in the joining station 11.

10 In the joining station 11, the receiving unit 56 is placed on a support 63 by lowering the arm 55 of the rotary table 8, as the arrow in Fig 4c indicates. Now the receiving unit 56 is completely borne by the support 63 and is largely detached from the arm 55 of the rotary table 8. Furthermore, in the joining station a hood 65 is moved over the receiving unit 56 and sealingly brought into contact with the even surface 59. This forms a closed chamber 66 between the hood 65 and the support 58 in which the substrate halves are received. The  
15 chamber 66 can be deaerated or vented via an apparatus (not shown in greater detail). A ram 67 is received vertically movable in the chamber 66 and extends in a sealed manner through an upper wall of the hood 65. In order to ensure the integrity of the chamber 66, the part of the ram 67 extending through the upper wall 65 is surrounded  
20 by a bellows (not shown in greater detail), one end of which is sealingly attached to the ram 67 and the other end of which is sealingly attached to the upper wall of the hood 65.

The ram 67 is vertically movable within the chamber 66, as the double arrow in Fig. 4c indicates. In Figure 4c, the ram 67 is shown in

a lowered position in which it presses the first and second substrate halves 6, 10 together. When pressing the substrates together, the ram 67 presses the substrate half 10 in the direction of the substrate half 6, whereby the noses 61 are pressed into the pin 60. In this process, the substrate half 10 is guided centered very precisely relative to the first substrate half 6 by the pin 60.

The noses can be pressed into the pin 60 by the forces exerted on the substrate 10. Alternatively, the noses can also be withdrawn into the pin 60 by an actuating mechanism provided in the ram. Such a mechanism is described for instance in the patent application cited above.

The pressure from the ram is controlled by a control apparatus (not shown in greater detail).

After the two substrate halves 6, 10 have been pressed together, the chamber 66 is aerated and then the ram 67 is raised together with the chamber 66. Then the arm 55 of the rotary table 8 is raised again in order to receive the receiving unit 56 again, and then it is moved further into position 4. There the two joined substrate halves are removed, placed on another rotary table 14, and processed further, as described with reference to Figure 1.

The present invention was described in the foregoing using a preferred exemplary embodiment of the invention, without, however, being restricted to this special exemplary embodiment. In particular, the apparatus described and the method described are not limited to



joining DVDs. In addition, it is possible, for instance, to replace the ram  
67 with an apparatus that presses the two substrate halves 6, 10  
together by means of compressed air. Such an apparatus has for  
instance an interior and an exterior O-ring on a plate in order to form a  
5 sealed chamber between the plate and a back side of the second  
substrate half 10. This chamber can be subjected to compressed air  
via the plate in order to press the two substrate halves together. This  
would result in a very uniform surface pressure that is contactless  
except for the O-rings, thus preventing limitations of the optical  
10 properties of the substrate half, for instance by scratching the back side  
of the second substrate half 10. A similar apparatus could also  
alternatively or additionally be formed in the receiving unit 56. The  
adhesive film used can be a so-called PSA tape that changes its  
adhesive properties depending on the pressure applied. Alternatively,  
15 the adhesive film can also be hardenable. The second substrate half  
can be made of an elastic material, such as a protective tape, which  
protects the surface of the substrate adhered with the adhesive film.

# Patent claims

1. Method for producing a data carrier in which at least two substrates are adhered to one another by applying to a first substrate (6) an adhesive film (25) that is adhesive on two sides; aligning a second substrate (6) with respect to said first substrate (6); and joining said substrates (6, 10) to one another, characterized in that said adhesive film (25) is pressed onto said substrate (6) using a rotating pressure roller (33) while said substrate (6) and said pressure roller (33) are moved relative to one another.
2. Method in accordance with claim 1, characterized in that said adhesive film (25) is withdrawn from a carrier film (26) during or after application to said first substrate (6).
3. Method in accordance with claim 1 or 2, characterized in that a protective film (24) is withdrawn from said adhesive film (25) prior to its application to said first substrate (6).
4. Method in accordance with any of the preceding claims, characterized in that the shape and size of said adhesive film (25) corresponds to the surfaces of said substrates (6, 10) to be adhered.
5. Method in accordance with any of the preceding claims, characterized in that sections (27) of said adhesive film (25) that correspond to the shape and size of said substrates (6, 10) are punched onto said carrier film (26).

6. Method in accordance with any of the preceding claims, characterized in that said adhesive film (25) is applied centered on the surface of said substrate (6) to be adhered.
- 5 7. Method in accordance with any of the preceding claims, characterized in that said adhesive film (25) and said substrate (6) are aligned with one another prior to application.
8. Method in accordance with any of the preceding claims, characterized in that the pressure of said pressure roller (33) is controlled.
- 10 9. Method in accordance with any of the preceding claims, characterized in that prior to pressing by said pressure roller (33) said adhesive film (25) is held at a pre-specified angle relative to the surface of said substrate (6).
- 15 10. Method in accordance with any of the preceding claims, characterized in that said substrate (6) is moved past said pressure roller (33) linearly.
11. Method in accordance with claim 12, characterized in that said pressure roller (33) is rotated synchronously to the movement of said substrate (6).
- 20 12. Method in accordance with any of the preceding claims, characterized in that said substrates (6, 10) are placed on a centering and holding device (60) for aligning them.

13. Method in accordance with claim 14, characterized in that said centering and holding device (60) holds said substrates (6, 10) spaced from one another prior to the joining.
14. Method in accordance with any of the preceding claims, characterized in that said substrates (6, 10) are joined in a vacuum.
15. Method in accordance with any of the preceding claims, characterized in that said substrates (6, 10) are pressed together.
16. Method in accordance with claim 17, characterized in that the pressure exerted on said substrates (6, 10) is controlled.
17. Method in accordance with any of the preceding claims, characterized in that said adhesive film (25) is an adhesive film (25) that responds to pressure.
18. Method in accordance with any of the preceding claims, characterized in that said adhesive film (25) is hardened.
19. Method in accordance with any of the preceding claims, characterized in that said adhesive film is made of one layer of adhesive material.
20. Apparatus for producing a data carrier with at least two substrates (6, 10) adhered to one another, with a laminating station (7) for applying to a first substrate an adhesive film (25) that is adhesive on two sides; and a substrate adhering station (11) for aligning and joining said substrates (6,

10), characterized in that said laminating station (7) has a rotatable pressure roller (33) and a device (47) for moving said substrate (6) and/or said pressure roller relative to one another.

21. Apparatus in accordance with claim 20, characterized in that the shape and size of said adhesive film (25) correspond to the surfaces of said substrates (6, 10) to be adhered.

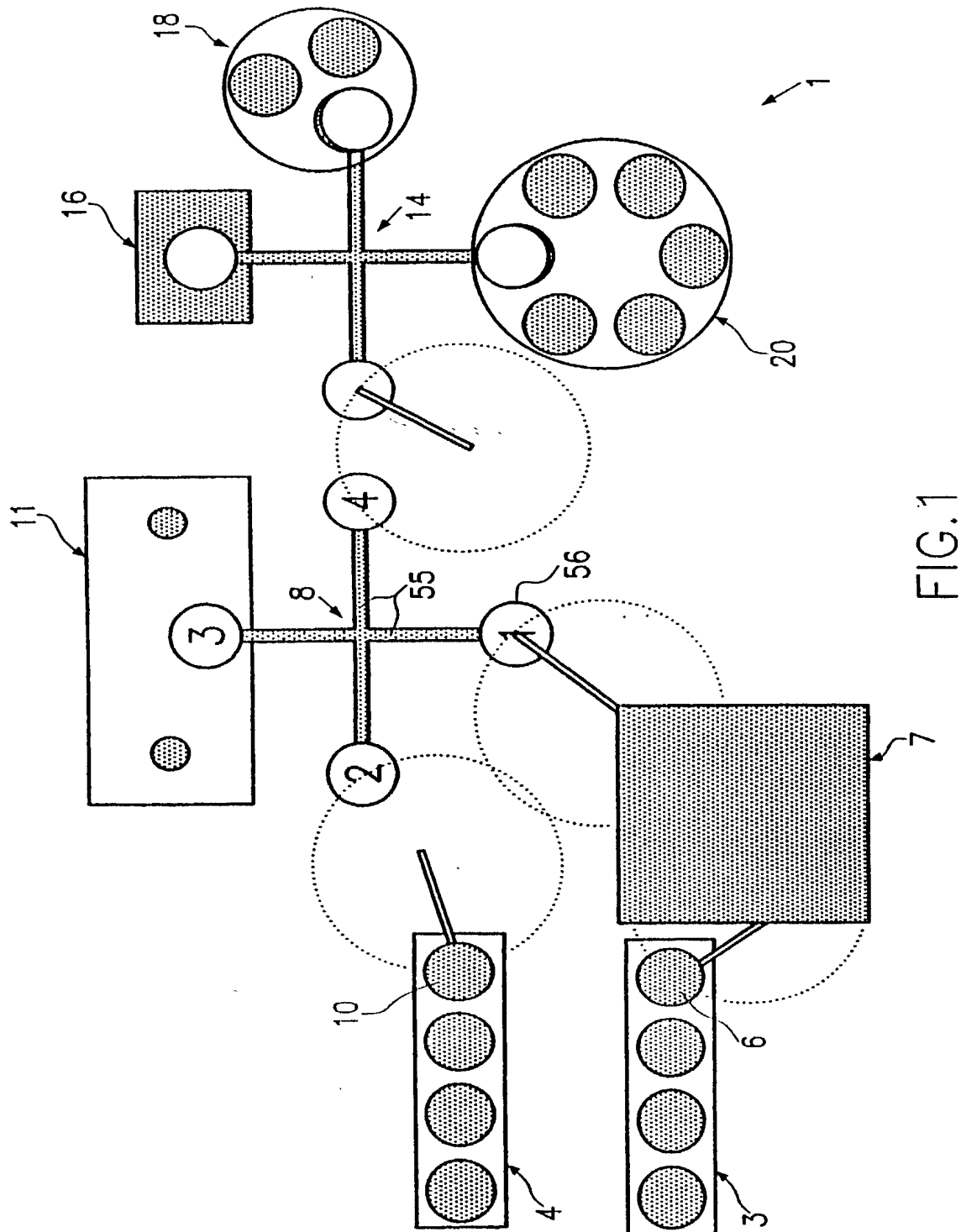
22. Apparatus in accordance with either of claims 20 or 21, characterized in that sections (27) of said adhesive film (25) that correspond to the shape and size of said surfaces of the substrates (6, 10) to be adhered are punched onto a carrier film (26).

23. Apparatus in accordance with any of claims 20 to 22, characterized in that said laminating station (7) has an aligning unit for aligning said adhesive film (25) with the surface of said substrate (6) to be adhered.

24. Apparatus in accordance with claim 23, characterized in that said device has at least one linear movement unit (47) for said substrate (6).

25. Apparatus in accordance with any of claims 20 through 24, characterized by a centering and holding device (60) that in a first position holds said substrates (6, 10) spaced from one another and in a second position enables centered joining of said substrates (6, 10).

26. Apparatus in accordance with any of claims 20 through 25, characterized in that said substrate adhering station (11) has a vacuum chamber (66).
27. Apparatus in accordance with claim 26, characterized in that said vacuum chamber (66) has a hood (65) and a base (59) that is formed by a substrate support element (58).
28. Apparatus in accordance with any of claims 20 through 27, characterized in that said substrate adhering station (11) has a pressure ram (67).
29. Apparatus in accordance with claim 28, characterized in that said pressure ram (67) has an element for actuating said centering and holding device (60) between said first and second positions.
30. Apparatus in accordance with any of claims 20 through 29, characterized in that said substrate adhering station (11) has an apparatus for applying compressed air on at least one of said substrates in order to press them together.
31. Apparatus in accordance with any of claims 20 through 30, characterized in that said adhesive film is a layer of adhesive material.



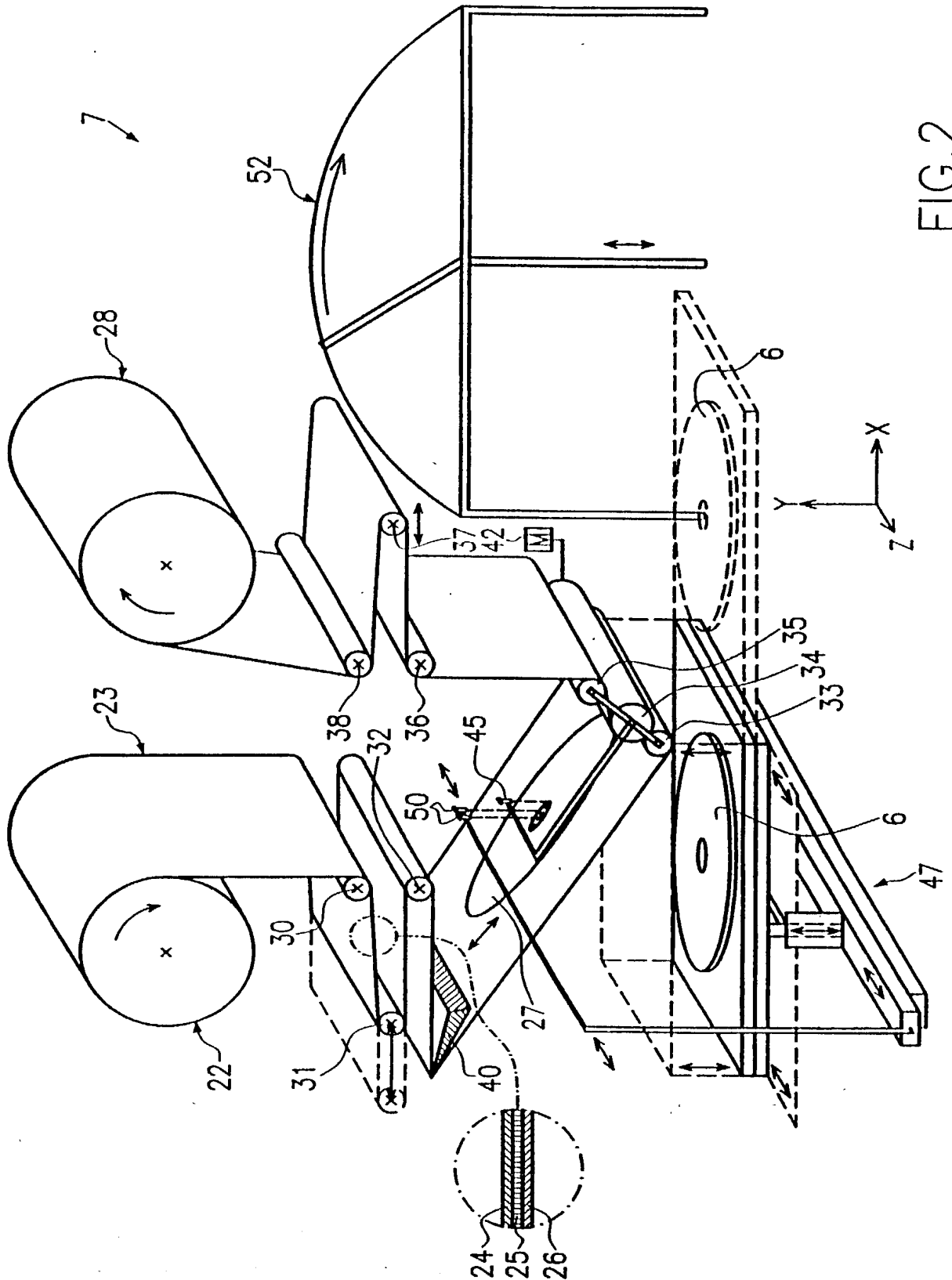


FIG. 2



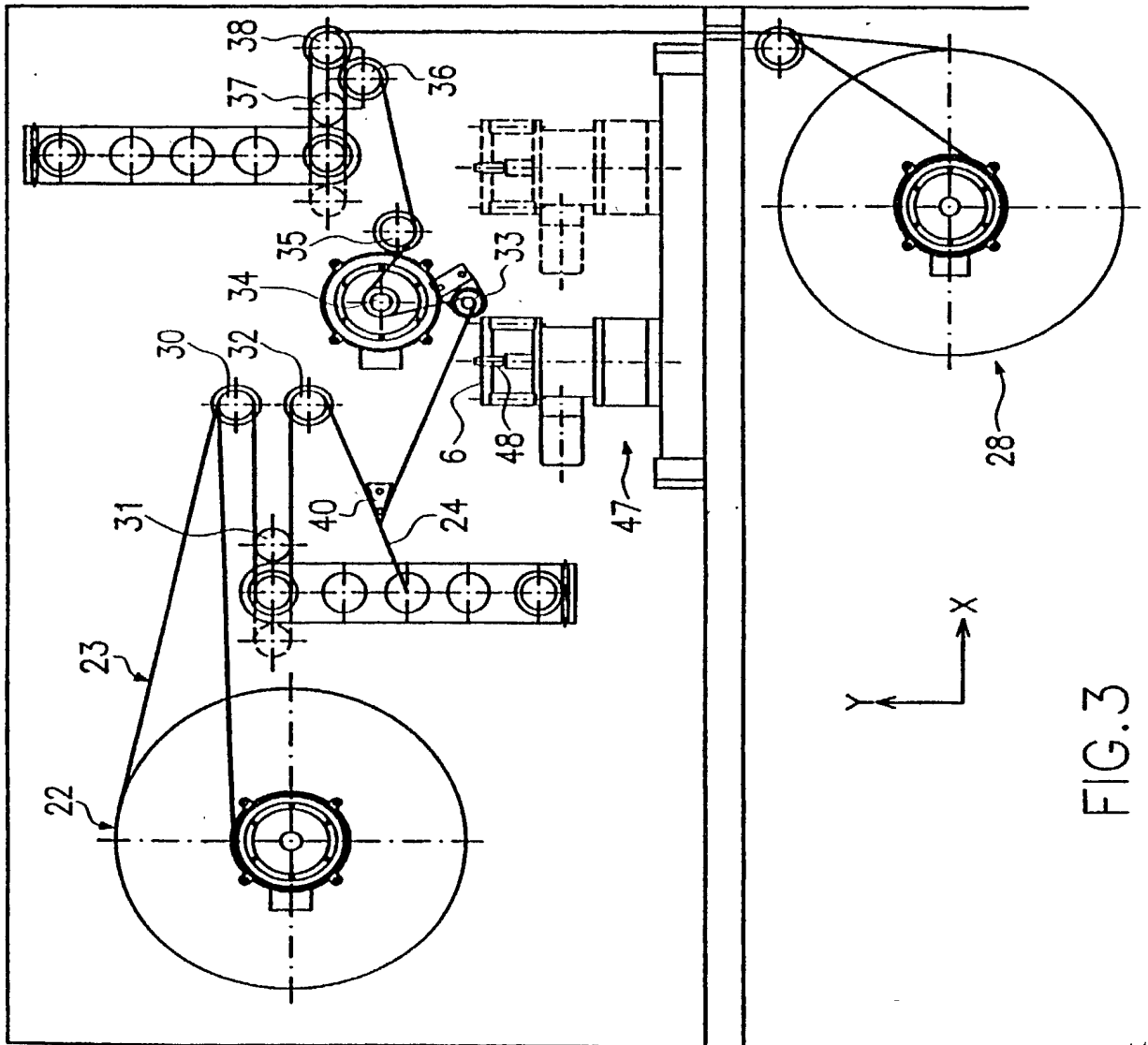
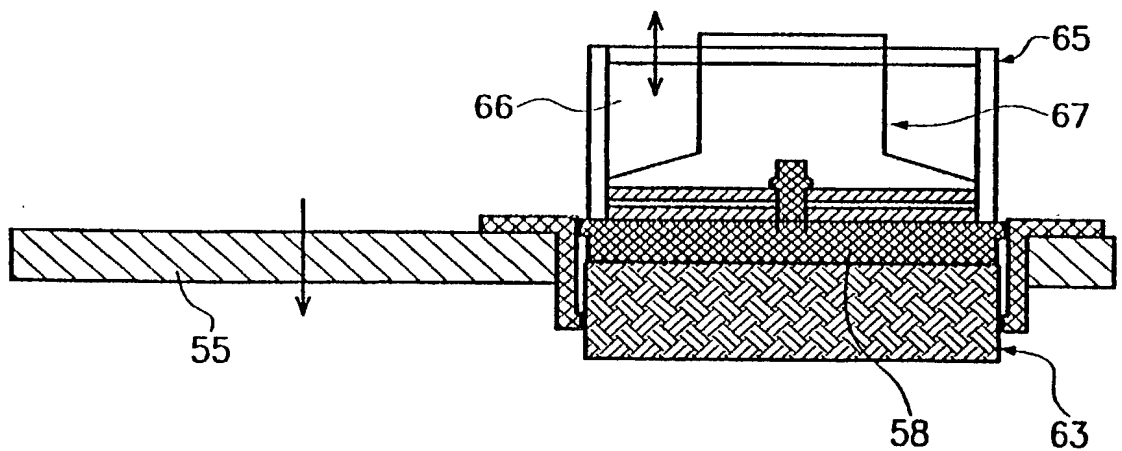
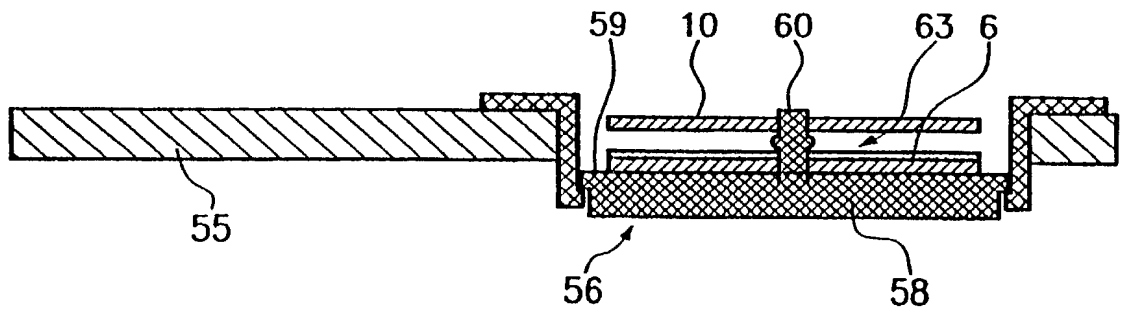
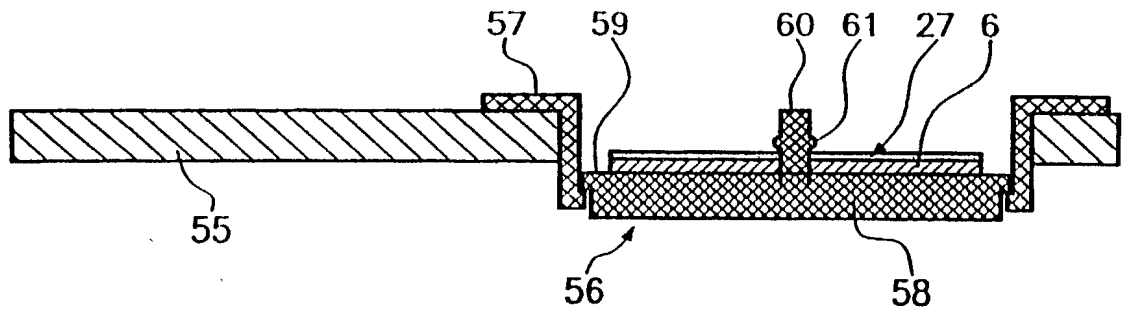


FIG. 3

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Attorney Docket No.  
AZ.3012

# COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As below named inventors, we hereby declare that:

Our residences, post office addresses and citizenships are as stated below next to our names, we believe we are the original, first inventors or original, first and joint inventors of the subject matter which is claimed and for which a patent is sought of the invention entitled:

APPARATUS AND METHOD FOR PRODUCING A DATA CARRIER  
the specification of which,

\_\_\_\_\_ is attached hereto;  
☒ was filed on 14 June 2000 as International Application No. PCT/EP00/05442 and is amended herewith as Serial No. 10/018,144

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose all information known by us to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

We hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s):

Priority  
Claimed:

<u>199 27 516.5</u>	<u>Germany</u>	<u>16 June 1999</u>	<u>XX</u>
(Number)	(Country)	(Day/Month/Year Filed)	Yes No

We hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

(Application Number) (Filing Date)

We hereby appoint attorney Robert W. Becker, Reg. No. 26,255, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. Address all telephone calls to (505) 286-3511. Address all correspondence to ROBERT W. BECKER & ASSOCIATES, 11896 N. Highway 14, Suite B, Tijeras, New Mexico 87059

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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